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CONTAINERLESS 1 'ROCESSI NG OF MI CTALS AND ALLOYS BY AN ELECTROSTATIC LEVITATOR

by
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Abstract

Recent progress in the high temperature electrostatic levitation technology will be presented. The system levitates high density metals or alloys in vacuum with good position stability, and the superheating-undercooli ng-nucleation cycle can be repeated. Principles involved in the electrostatic levitation will be discussed as we present some specific undercooling experiments in nickel, zirconium, copper and aluminum.

Historically the Electromagnetic Levitator (EML) has been the only system used to levitate a macroscopic object in vacuum for high temperature processing. I lowever, what mainly distinguishes EML with the Electrostatic Levitator (ESL) will be that : (i) Materials which EML levitates arc primarily limited to electric conductors while ESL may accommodate broader range of materials. (ii) Heating and levitation in ESL do not interfere with each other while the electromagnetic field needed for levitation is intrinsically coupled to sample heating in EML. (iii) ES]. provides a quiescent environment throughout sample processing while a molten sample levitated by an EML is subjected to strong internal flows which may cause premature nucleation in the undercooled melts. (iv) Levitation and heating coils in EML arc closely wound around a levitated sample restricting the views from diagnostic instruments while ESL provides a more open view. The electrostatic levitator, when fully matured, will be valuable for the undercooling and nucleation experiments both in 1-g and micro-g environments.

A 2 minute video segment will be shown during the presentation,

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